PROGRAMME SPECIFICATION

Master of Engineering in Mechanical Engineering

Awarding institution	Liverpool John Moores University
Teaching institution	LJMU
UCAS Code	H301
JACS Code	H300
Programme Duration	Full-Time: 4 Years, Sandwich Thick: 5 Years
Language of Programme	All LJMU programmes are delivered and assessed in English
Subject benchmark statement	Engineering Council UK Spec
Programme accredited by	IMechE
Description of accreditation	The programme partially fulfils the educational requirements for CEng http://www.engc.org.uk
Validated target and alternative exit awards	Master of Engineering in Mechanical Engineering Master of Engineering (SW) in Mechanical Engineering Bachelor of Engineering with Honours in Mechanical Engineering Bachelor of Engineering Honours (SW) in Mechanical Engineering Diploma of Higher Education in Mechanical Engineering Diploma in Higher Education (SW) in Mechanical Engineering Certificate of Higher Education in Mechanical Engineering
Programme Leader	Allan Carrier

Educational aims of the programme

The M.Eng. programme in Mechanical Engineering fulfils all the educational requirements for Chartered Engineer status. It is designed to develop a high level of technical expertise together with the emotional intelligence to be able to practice successfully as a professional engineer in a modern interdisciplinary engineering environment. Graduate engineers are increasingly expected to take on important technical leadership and management responsibilities early in their careers and the knowledge and skills gained from this programme are designed to produce graduates who are able to make an immediate contribution to their employers organisations.

The programme aims to:

- Develop students transferable skills and professional behavioral traits above those associated with a M.Eng graduate that will allow students that complete the programme to hold responcible technical and managerial roles within a range of mechanical engineering and associated industries.

- Deliver the educational experience in which students can develop their knowledge of engineering science, core engineering principles and fundamental underpinning subjects such as mathematics and computation.

- Develop students confidence to analyse challenging technical problems and to further develop their core engineering knowledge and skills through the investigation and development of credible and robust solutions.

- Provide students with appropriate support and encouragement to develop the necessary skills such that they can study independently and take responsibility for their own learning and subsequent professional development.

- Provide engineering graduates with a range of highly relevant transferable skills such as team working, communication, management, problem solving, computing and technical computing.

- Provide a programme of study that fully meets the requirements of the Engineering Councils UK Standard for Professional Engineering Competence (UKSpec) and qualifies the successful graduate for the attainment of the Engineering Council Chartered Engineer status after completion of an appropriate period of industrial experience.

- Produce graduates with an increased depth, breadth of knowledge and understanding of mechanical engineering, management and teamwork to enable them to rapidly assume technical leadership and management roles.

- Encourage students to fully engage with the World of Work programme, including World of Work Skills Certificate and, as a first step towards this, to complete Bronze (Self Awareness) Statement.

-For students undertaking a placement year the aim is to provide students with an extended period of work experience at an approved partner that will complement their programme of study at LJMU. This will give the students the opportunity to develop professional skills relevant to their programme of study, as well as attitude and behaviours necessary for employment in a diverse and changing environment.

The programme is currently accredited by the Institute of Mechanical Engineers and meets the requirements of the Engineering Councils 'UK Standard for Professional Engineering Competence' (UKSpec).

Alternative Exit/ Interim Award Learning Outcomes - Certificate of Higher Education

A student who is eligible for this award will be able to:

Undertake suitable basic mathematical analysis.

Apply the basic principles of applied mechanics, thermodynamics and fluid mechanics, materials science and electrical engineering to simplified engineering problems.

Design and manufacture simple engineering components and assemblies.

Demonstrate key skills appropriate to the professional engineer.

Alternative Exit/ Interim Award Learning Outcomes - Diploma of Higher Education

A student who is eligible for this award will be able to:

Undertake advanced mathematical and computational studies of engineering systems and problems.

Demonstrate the application of intermediate level applied mechanics, thermodynamics and fluid mechanics, and electrical engineering from to the solution of standard engineering problems.

Demonstrate the intermediate engineering skills that will be required for further study.

Demonstrate a competence in technical reporting and an ability to analyse and present engineering data.

A student who successfully completes a placement year will be eligible for the Sandwich award and will, in addition to the above, be able to demonstrate the professional and personal skills necessary for effective employment within a professional environment.

Alternative Exit/ Interim Award Learning Outcomes - Bachelor of Engineering Honours (SW)

A student who is eligible for this award will be able to:

Demonstrate a detailed understanding of modern Mechanical Engineering techniques and management skills, together with a detailed understanding of their chosen specailisms that is at the forefront of the engineering discipline and informed by research.

Demonstrate the ability to use established techniques of analysis and enquiry to solve problems within the field of Mechanical Engineering.

Demonstrate ability to devise and sustain arguments and solve problems using ideas and techniques that are at the forefront of the engineering discipline.

Demonstrate an appreciation of the ambiguity, uncertainty and limitations of their knowledge.

Demonstrate the professional and personal skills necessary for effective employment within a professional environment.

Alternative Exit/ Interim Award Learning Outcomes - Bachelor of Engineering with Honours

A student who is eligible for this award will be able to:

Demonstrate a detailed understanding of modern Mechanical Engineering techniques and management skills, together with a detailed understanding of their chosen optional modules that is at the forefront of the engineering discipline and informed by research.

Use established techniques of analysis and enquiry to solve problems within the field of engineering.

Devise and sustain arguments and solve problems using ideas and techniques that are at the forefront of the

engineering discipline.

Demonstrate an appreciation of the ambiguity, uncertainty and limitations of their knowledge.

Target award Learning Outcomes - Master of Engineering

A student successfully completing the programme of study will have acquired the following subject knowledge and understanding as well as skills and other attributes.

A student who is eligible for this award will be able to:

1. Demonstrate their knowledge and understanding of essential facts, concepts, theories and principles of their engineering discipline, and its underpinning science and mathematics. They must have an appreciation of the wider multidisciplinary engineering context and its underlying principles. They must appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgment.

2. Demonstrate a comprehensive understanding of the scientific principles of mechanical and related engineering disciplines.

3. Demonstrate comprehensive knowledge and understanding of mathematical and computer models relevant to the mechanical and related engineering disciplines, and an appreciation of their limitations

4. Demonstrate an understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in engineering projects.

5. Demonstrate an awareness of developing technologies related to mechanical engineering.

6. Use fundamental knowledge to investigate new and emerging technologies

7. Extract data pertinent to an unfamiliar problem, and apply its solution using computer based engineering tools when appropriate.

8. Apply mathematical and computer-based models for solving problems in engineering, and the ability to assess the limitations of particular cases.

9. Apply appropriate quantitative science and engineering tools to the analysis of problems. They must be able to demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs. They must be able to comprehend the broad picture and thus work with an appropriate level of detail.

10. Make general evaluations of commercial risks through some understanding of the basic of such risks.

11. Demonstate an extensive knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately to strategic and tactical issues.

12. Understand the requirement for engineering activities to promote sustainable development.

13. Demonstrate an awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues.

14. Understand the need for a high level of professional and ethical conduct in engineering.

15. Illustrate an understanding of and the ability to apply a systems approach to engineering problems.

16. Apply practical engineering skills acquired through, for example, work carried out in laboratories and workshops; in industry through supervised work experience; in individual and group project work; in design work; and in the development and use of computer software in design, analysis and control. Evidence of group working and of participation in a major project is expected.

17. Demonstrate a thorough understanding of current practice and its limitations and some appreciation of likely new developments.

18. Demonstrate an extensive knowledge and understanding of a wide range of engineering materials and components.

19. Understand the context in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc).

20. Demonstrate a wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations.

21. Illustrate an understanding of customer and user needs and the importance of considerations such as aesthetics.

22. Identify and manage cost drivers.

23. Generate an innovative design for products, systems, components or processes to fulfil new needs.

24. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal.

25. Demonstrate an abliity to manage the design process and evaluate outcomes.

26. Demonstrate transferable skills including problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills.

27. Demonstrate the use of technical literature and other information sources.

28. Demonstrate an awareness of nature of intellectual property and contractual issues.

29. Demonstrate the understanding of appropriate codes of practice and industry standards.

30. Illustrate an awareness of quality issues.

31. Demonstrate an ability to apply engineering techniques taking account of a range of commercial and industrial constraints.

Alternative target awards

A student who is eligible for the following awards will be able to:

Master of Engineering (SW) in Mechanical Engineering -

In addition to the learning outcomes for the main target award, demonstrate the professional and personal skills necessary for effective employment within a professional environment.

Teaching, Learning and Assessment

The methods used to enable outcomes to be achieved and demonstrated are as follows:

Acquisition of underpinning knowledge is achieved mainly through lectures and directed student-centred learning. Student-centred learning is used where appropriate resource material is available. Understanding is reinforced through case-studies.

Testing of the knowledge base is through a combination of unseen written examinations, online assessment, coursework in the form of case-study reports and coursework assignment submissions.

The students must appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement.

Acquisition of Intellectual skills is acheived mainly through lectures and direct student-centred learning. Student-centred learning is used where appropriate resource material is available. Understanding is reinforced through case-studies.

Engineering design, analysis and practical skills are taught almost exclusively by individual and group project work supported by a lecture programme appropriate to the demands of the project.

Engineering design and pracical skills are assessed by individual and group written design project reports, student presentations and presentations using computer graphics.

The economic, Social and Environmental context of engineering operations is delivered by means of lectures and case studies. The use of appropriate case study material is an essential part of teaching in this area.

Assessment is via a combination of unseen written examinations and coursework in the form of case-study reports.

Programme structure - programme rules and modules

The marks from level 5, 6 and 7 assessments contribute to the final degree classification i.e. 10% of Level 5 marks, 30% of Level 6 marks and 60% of Level 7 marks.

Option Modules

Student are required to select two option modules at L6, one from each semester. The options are:-

Semester One

Fluid Dynamics and Heat Transfer

Materials Engineering

Manufacturing Processes and Industrial Automation

Vehicle Dynamics

Semester Two

Thermodynamics

Structural Integrity

Dynamics and Control

At L7 students are required to select three option modules.

Students have the option to undertake a placement year. The placement year, module 5111MECH, will follow Level 5 and students will be enrolled on a 600 credit honours sandwich programme. The Level 5 mean for the final award mark will be calculated based upon the 240 credits at Level 5. Students successfully completing the assessment of the placement year are eligible for a Sandwich award.

Students not undertaking a placement year are registered on the non-sandwich version of the programme and will have the opportunity of an additional study year abroad following Level 5. Students will be enrolled on a 600 credit honours with study abroad programme. Of those 600 credits, 120 will be taken via a Level 5 study abroad module 5112MECH. The modules to be studied in the host institution must be agreed in advance. The Level 5 mean for the final award mark will be calculated based upon the 240 credits at Level 5.

Level 7	Potential Awards on completion	Master of Engineering
Core	Option	Award Requirements
7101MECH Group Project (40 credits) 7124MECH Operations Research (20 credits)	7107MECH Finite Element Analysis (20 credits) 7108MECH Conventional and Alternative Energy Systems (20 credits) 7109MECH Offshore Engineering (20 credits) 7110MECH Computational Fluid Dynamics (20 credits) 7111MECH Advanced Materials and Manufacturing Processes (20 credits) 7112MECH Structural Dynamics (20 credits) 7113MECH Additive Manufacturing Processes (20 credits)	60 core credits at level 7 60 option credits at level 7

Level 6	Potential Awards on completion	
Core	Option	Award Requirements
6101MECH Engineering Project (40 credits) 6102MECH Engineering Analysis (20 credits) 6103MECH Mechanical Engineering Design 3 (20 credits) 6104MECH Industrial Management (20 credits)	6108MECH Fluid Dynamics and Heat Transfer (10 credits) 6109MECH Thermodynamics (10 credits) 6110MECH Materials Engineering (10 credits) 6111MECH Structural Integrity (10 credits) 6112MECH Manufacturing Processes and Industrial Automation (10 credits) 6113MECH Dynamics and Control (10 credits) 6114MECH Vehicle Dynamics (10 credits)	100 core credits at level 6 20 option credits at level 6

Level 5	Potential Awards on completion	
Core	Option	Award Requirements
5102MECH Engineering Mathematics 2 (10 credits) 5103MECH Materials and Processes (10 credits) 5104MECH Applied Mechanics 2 (20 credits) 5105MECH Thermodynamics and Fluid Mechanics 2 (20 credits) 5106MECH Mechanical Engineering Design 2 (20 credits) 5107MECH Engineering Practice 2 (20 credits) 5108MECH Mechatronics (20 credits)		120 core credits at level 5 0 option credits at level 5

Level 4	Potential Awards on completion	

Core	Option	Award Requirements
4101MECH Engineering Mathematics 1a (10 credits) 4102MECH Engineering Mathematics 1b (10 credits) 4103MECH Applied Mechanics 1 (20 credits) 4104MECH Thermodynamics and Fluid Mechanics 1 (20 credits) 4105MECH Materials (20 credits) 4106MECH Engineering Practice 1 (20 credits) 4107MECH Electrical and Electronic Engineering (20 credits)		120 core credits at level 4 0 option credits at level 4

Information about assessment regulations

All programmes leading to LJMU awards operate within the University's Academic Framework.
https://www.ljmu.ac.uk/about-us/public-information/academic-quality-and-regulations/academic-framework

The module Engineering Practice 2 (5107MECH) will be delivered year-long across both semesters to allow student access to the required Laboratory provision during the academic 2020-21 due to the Covid 19 pandemic.

Opportunities for work-related learning (location and nature of activities)

Students are encouraged to undertake a year long industrial placement either between Level 5 and 6. There is a further opportunity to undertake summer placements between academic years to gain valuable industrial experience.

There are also opportunities to complete industrially based projects via individual engineering projects at Level 6 and 7, and group engineering project module at Level 7.

This work experience will help develop understanding of the world of work environment suitable for the programme and increase a student's professional practical skills.

Criteria for admission

A/AS Level
Applicants should have or expect to obtain a total of 128 UCAS points. At A2-level, applicants are expect to gain at least 80 points from Mathematics and one of following; (Physics, Chemistry, Computing, Further Maths, Electronics or Engineering).

BTEC National Diploma
BTEC National Diploma

BTEC Extended Diploma

Applicants should have or expect to obtain a total of 128 UCAS points (DDM), in an Engineering discipline with a

Distinction grade in the Further Mathematics unit. Specific optional units must also be completed, please contact

the Faculty of Engineering and Technology (FET) for more information.

BTEC Diploma / 90 Credit Diploma / Subsidiary Diploma /Certificate

To the value of 128 UCAS points when combined with other qualifications. Must be in an Engineering discipline.

A Distinction grade in the Further Mathematics unit is required.

AVCE
Applicants should have or expect to obtain a total of 128 UCAS points. At A2-level, applicants should expect to obtain at least two awards and gain at least 80 points from mathematics and a scientific or technical subject relevant to the intended degree (e.g. Physics).

Irish Leaving Certificate
Applicants should have or expect to obtain a total of 128 UCAS points overall including a grade A1 in Higher Level Mathematics and grade A1 in another relevant technical subject at Higher Level eg.Physics.

Scottish Higher

Applicants should have or expect to obtain a total of 128 UCAS points. At higher-level or advanced higher-level, applicants should expect to obtain at least two awards and gain at least 80 points, from Mathematics and one of the following; Physics, Chemistry, Computing, Further Maths, Electronics or Engineering.

International Baccalaureate
Applicants should have or expect to obtain the equivalent of 128 UCAS points (26 IB Diploma points) overall with 5 IB points in HL Mathematics and 5 IB points in HL Physics.

Other
Applicants should have five GCSE (or equivalent) passes of at least grade C including Mathematics and English (or IELTS 6.0).

Mature entry
We welcome applications from highly motivated mature students with relevant experience but without the necessary formal qualifications. All applications will be considered on an individual basis.

Overseas qualifications
Applicants offering other awards will be considered on an individual basis in line with the agreed entry criteria.

External Quality Benchmarks

All programmes leading to LJMU awards have been designed and approved in accordance with the UK Quality Code for Higher Education, including the Framework for Higher Education Qualifications in the UK (FHEQ) and subject benchmark statements where applicable.

The University is subject to periodic review of its quality and standards by the Quality Assurance Agency (QAA) Published review reports are available on the QAA website at www.qaa.ac.uk

Programmes which are professionally accredited are reviewed by professional, statutory and regulatory bodies (PSRBs) and such programmes must meet the competencies/standards of those PSRBs.

Support for students and their learning

The University aims to provide students with access to appropriate and timely information, support and guidance to ensure that they are able to benefit fully from their time at LJMU. All students are assigned a Personal Tutor to provide academic support and when necessary signpost students to the appropriate University support services.

Students are able to access a range of professional services including:

- Advice on practical aspects of study and how to use these opportunities to support and enhance their personal and academic development. This includes support for placements and careers guidance.
- Student Advice and Wellbeing Services provide students with advice, support and information, particularly in the areas of: student funding and financial matters, disability, advice and support to international students, study support, accommodation, health, wellbeing and counselling.
- Students studying for an LJMU award at a partner organisation will have access to local support services

Methods for evaluating and improving the quality and standards of teaching and learning

Student Feedback and Evaluation

The University uses the results of student feedback from internal and external student surveys (such as module evaluations, the NSS and PTES), module evaluation questionnaires and meetings with student representatives to improve the quality of programmes.

Staff development

The quality of teaching is assured through staff review and staff development in learning, teaching and assessment.

Internal Review

All programmes are reviewed annually and periodically, informed by a range of data and feedback, to ensure quality and standards of programmes and to make improvements to programmes.

External Examining

External examiners are appointed to programmes to assess whether:

- the University is maintaining the threshold academic standards set for awards in accordance with the FHEQ and applicable subject benchmark statements

- the assessment process measures student achievement rigorously and fairly against the intended outcomes of the programme(s) and is conducted in line with University policies and regulations
- the academic standards are comparable with those in other UK higher education institutions of which external examiners have experience
- the achievement of students are comparable with those in other UK higher education institutions of which the external examiners have experience

and to provide informative comment and recommendations on:

- good practice and innovation relating to learning, teaching and assessment observed by external examiners
- opportunities to enhance the quality of the learning opportunities provided to students

Please note:

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content, teaching, learning and assessment methods of each module can be found in module and programme guides.